UNIVERSITI TEKNOLOGI MARA

BULETIN APB

EDUCATION FOR BETTER FUTURE



EDISI 17

OKTOBER 2026

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UNIVERSITI TEKNOLOGI MARA
CAWANGAN NEGERI SEMBILAN
KAMPUS SEREMBAN

e-ISSN : 2682-7948

You Cannot Rush a Culture: Growing Minds for a Better Future

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On the third morning, the plate finally shows something. A student who checks the incubator twice a day lifts the lid, and there they are: a dozen small, cream-coloured colonies where, the day before, there was nothing but empty agar. She looks up with an expression no lecture slide has ever produced. Nothing about that moment could be rushed, downloaded or summarised. It needed the right conditions and then time.

Years of teaching Microbiology and supervising bench-level final-year projects led to a core realisation: the laboratory is far more than a space for scientific instruction. It is the clearest operational model of the learning process, offering a prototype for what education must become to prepare students for an unpredictable future.

Setting the conditions for growth.



Microbiologists do not grow cultures. We create the environment in which growth is possible, and the organism takes care of the rest. The medium must contain the right nutrients, the temperature must stay constant, and the plate should be left alone long enough for something to appear. If you choose the wrong medium and nothing grows, nothing will grow. If you open the incubator too early, you may mistake an unfinished plate for a failed one. Teaching works in the same way, and three conditions matter most:

1. **A real problem to work on.** Students make faster progress when they face questions not already answered in a textbook. Converting spent mushroom waste—a discarded agricultural by-product—into a biofertiliser carrier for beneficial soil bacteria provides final-year students with a hands-on, uncertain learning environment. Active-learning research indicates that students who apply concepts in practice outperform those who observe passively (Freeman et al., 2014).

2. **Room to fail without penalty.** In the learning process, it is important to have space for mistakes without fear of punishment. If a student gets a contaminated plate, it shouldn't be seen as a wasted effort. It's an opportunity to investigate the technique and learn the lessons. If students are allowed to make errors and learn from them, they become scientists. If you shield them from errors, they learn to follow instructions without real understanding.

3. **Patience, held by the teacher.** As with growth curves, students also go through periods where they don't show immediate improvement. The quiet student in week three can become a confident

e-ISSN : 2682-7948

presenter by week ten. Our job in these early phases is to keep the environment supportive and to resist the urge to pull them back just because nothing is showing up yet. This is a slow shift from hands-on to reflective thinking (Doutor & Alves, 2022).

Education Beyond the Lab

For students, learning does not end when they leave the lab. For example, when students culture bacteria from a chicken sample, they don't just hone their aseptic skills; they're tackling real-life problems. They learn why a night market vendor carefully controls temperatures and why halal standards matter. Our curriculum focuses on food safety, halal assurance, and sustainable agriculture. When students understand the purpose of their studies, they can see how it applies in real-life situations.

Teaching in the Age of Artificial Intelligence

Many worry that artificial intelligence will render much of what we teach irrelevant. An investigation into student perspectives on AI in the Diploma in Microbiology and the Bachelor of Science in Biology programmes reveals distinct usage patterns based on cognitive demand. Students frequently use AI tools to retrieve foundational information, yet rely far less on AI when asked to articulate and defend independent scientific judgements.

This distinction is fundamental. A language model can write a very good paragraph about Gram staining quickly. But it can't physically analyse a sample or determine whether the smear was over-decolourised. Technology takes over information retrieval, and we need to focus on what it struggles with: making judgements in uncertain situations, maintaining integrity when no one is watching, and having the patience to tackle problems without immediate solutions. UNESCO (2021) echoes this sentiment, calling for a new social contract for education, one focused on long-term human skills rather than quick content delivery.



Conclusion

Education, like a culture plate, cannot be hurried. The student who lifted the incubator lid on the third morning learned because the conditions were right and she was given time, not because someone handed her the answer. Building a better future therefore depends less on sweeping curriculum reform than on the small, meaningful choices we make in our daily teaching: asking questions that have not yet been answered, giving students room to fail, and patiently helping them learn from those failures. As artificial intelligence takes over more of the work of finding and summarising information, these choices matter even more, because no machine can supply the judgement to read an uncertain result, the integrity to report it honestly or the patience to keep going until something grows. These qualities can only be cultivated, never downloaded. Our students will graduate, and much of what they memorised will fade. What should stay with them is the

understanding that care and patience can produce something real and valuable and that it is worth nurturing. If they carry that lesson into the next stage of their lives, we will have taught them what matters most, perhaps not by the first morning but, like the colonies on the plate, in their own time.

Figure 1

Students at Work in the Microbiology Teaching Laboratory at UiTM Cawangan Negeri Sembilan, Kampus Kuala Pilah



Note. Image from the author's personal collection.

References

Doutor, C., & Alves, N. (2022). Experiential training and biographical learning: reflecting to give meaning to senses to . experiences?.*Educação e Pesquisa*,*48*, 24–35

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*(23), 8410–8415.

United Nations Educational, Scientific and Cultural Organization. (2021). *Reimagining our futures together: A new social contract for . education*. UNESCO Publishing